

ONTARIO MINISTRY OF ENVIRONMENT
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1971

OPERATING
SUMMARY
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BELLEVILLE

WATER POLLUTION CONTROL PLANT

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Belleville : water pollution
control plant.

81620

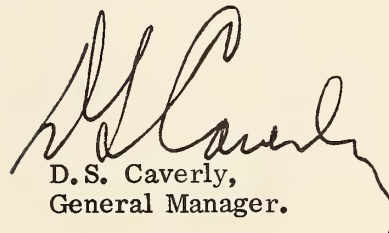


Water management in Ontario

Ontario
Water Resources
Commission

We are pleased to submit for your consideration a summary of operation during 1971 of the water pollution control plant serving your community.

This operating summary contains parameters normally used to measure plant performance and loading, as well as relevant cost data. Because of the concern over eutrophication of our lakes and of the requirement, in many parts of Ontario, to remove the major contributing factor, results of analysis for phosphorus appear in this summary.



D.S. Caverly,
General Manager.



D.A. McTavish, P. Eng.,
Director,
Division of Plant Operations.

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135 St. Clair Avenue West
Toronto 195

BELLEVILLE
WATER POLLUTION CONTROL PLANT

operated for

THE CITY OF BELLEVILLE

by the

ONTARIO WATER RESOURCES COMMISSION

1971 ANNUAL OPERATING SUMMARY



Environment Ontario
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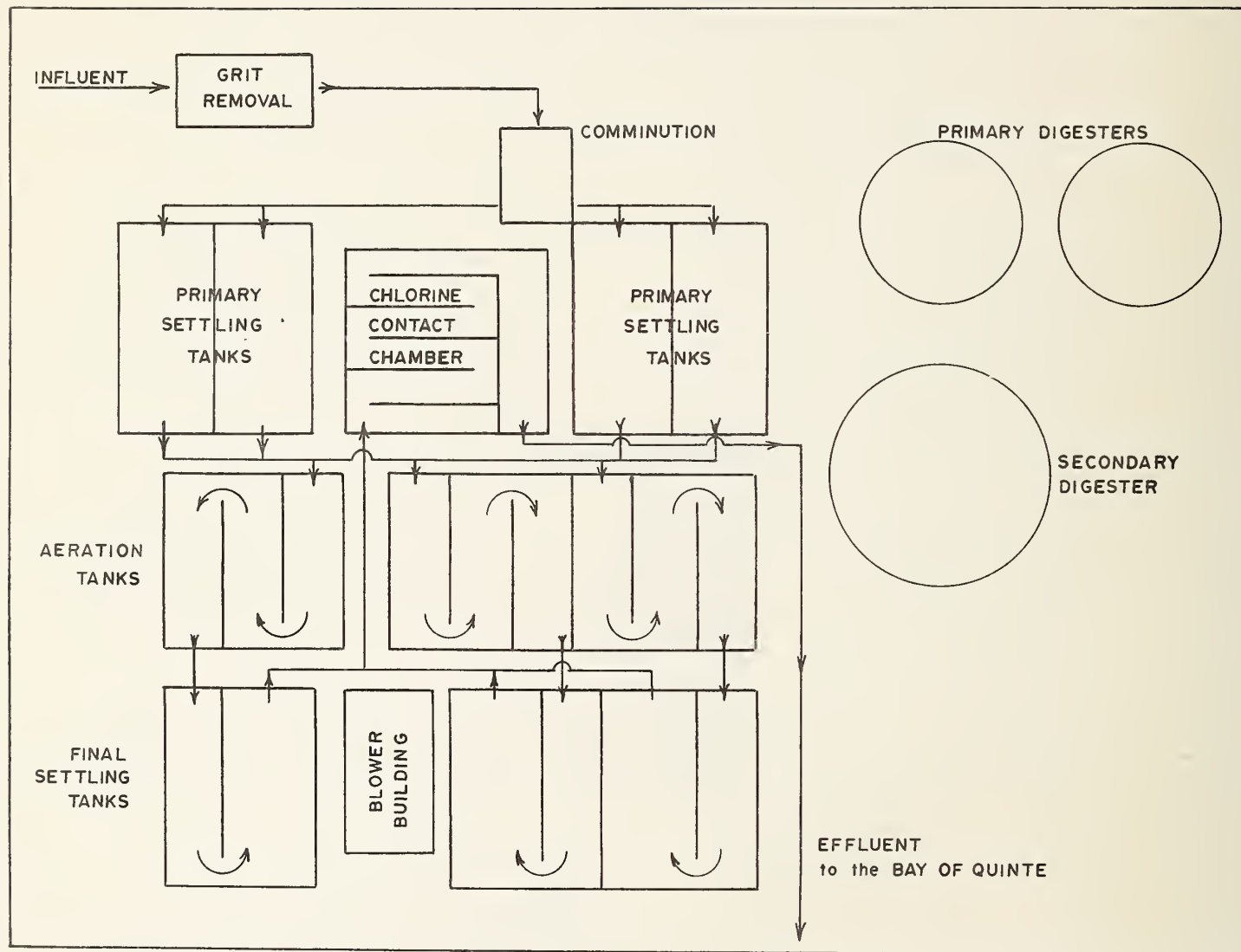


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CONTENTS

Title Page		1
Flow Diagram		4
Design Data		5
'71 Review		7
Project Costs		10
Process Data		11



PROJECT NO. 1-0004-66

TREATMENT Activated Sludge

DESIGN FLOW 8.0 mgd

DESIGN POPULATION 52,000

BOD - Raw Sewage 130 mg/l
- Removal 88%

SS - Raw Sewage 175 mg/l
- Removal 91%

PRIMARY TREATMENT

Grit Removal

Type: Aerated grit tank with grab bucket

Size: Two 24' x 24' x 12 $\frac{1}{2}$ '
(52,400 gal)

Retention: 9.4 minutes

Air Supply: Two Roots blowers
610 scfm each

Two Aerzener Rotary 350 scfm
each

Screening

Type: Mechanically cleaned
Size: 2" opening

Comminution

Type: Two Chicago Pump
barminutor Model C-36

Primary Sedimentation

Type: Falk

Size: Four 70' x 36' x 12'
(752,000 gal total)

Retention: 2.3 hours

Loading: Surface; 795 gal/ft²/day
Weir; 14,700 gal/ft/day

SECONDARY TREATMENT

Aeration Tanks

Type: Diffused air, three pass
Size: Three 60' x 20' x 12' of 3
passes

(809,000 gal total)

Retention: 2.4 hours

Air Supply

Type: Aerzen Maschinen fabric
Size: Three 2280 scfm @ 7 psi

Diffusers

Type: Sparjers - 5/16"
Spacing: 4 inch centers

Secondary Sedimentation

Type: Falk

Size: Three 83' x 56.5' x 12'
(2 pass)

(1,070,000 gal total)

Retention: 3 hours

Loading: Surface 800 gal/ft²/day
Weir 13,000 gal/ft/day

CHLORINATION

Type: Fischer & Porter
Size: One 1,000 lb/day
One 1,500 lb/day

Chlorine Contact Chamber

Size: 54.7' x 60' x 11' (167,000 gal)
Retention: 30 minutes

Outfall

Approx. 280' of 48" dia. concrete pipe
and 1179' of 36" dia. concrete pipe to
Bay of Quinte

SLUDGE HANDLING

Digestion System

Type: Two stage

Primary:

Type: Gas mixed
Size: Two 45' dia. x 27' swd
(79,400 ft³ total)

Secondary:

Type: Non mixed
Size: One 55' dia. x 27' swd
(59,400 ft³ total)

PUMPING STATIONS

a) Plant site @ 35' tdh

One Worthington 2500 gpm (electric)
One Worthington 1666 gpm (electric)
One Worthington 2500 gpm (electric and diesel)

b) Front Street

One Worthington 2500 gpm (electric @ 55' tdh)
One Worthington 1666 gpm (electric @ 55' tdh)
One Worthington 3332 gpm (diesel and electric
@ 55' tdh)
One Fairbanks Morse 4400 gpm (diesel @ 42'
tdh)

c) Dundas Street West

One Worthington 416 gpm (electric @ 29' tdh)
One Worthington 1300 gpm (diesel @ 40' tdh)

'71 Review

GENERAL

During the first portion of the year, the project consisted of a 3.0 IMGD primary treatment plant with two stage digestion, three pumping stations and associated trunk sewers and forcemains. The plant was expanded to an 8.0 IMGD activated sludge plant with an additional digester. The capacity of the two pumping stations was also increased. This expansion program was completed during August 1971. New control panels were installed in the Front Street and plant pumping stations. This improved the operation of the sewage pumps considerably.

An eight inch supernatant line was installed from the digester overflow to the wet well at the plant pumping station. This new line was necessary as the old digester overflow system became inoperable due to the increased heads on the forcemain between the plant pumping station and the grit tank.

Part of the plant grounds were landscaped in September of 1971. This greatly improved the appearance of this area.

The majority of the buildings at the plant were completely repainted as part of the clean up program.

Some of the mechanical repairs undertaken during the year were, a new shaft installed in the #2 pump at the Front Street pumping station, new pistons were installed on the old sludge pumps, and new impellers and bearings were installed in the #2 air blower. The old transmitters and recorders were overhauled.

Three additional operators, a lab technician and a maintenance electrician were hired in 1971. The total plant staff consisted of 10 men at the end of 1971. The plant staff are to be commended for their work during the past year.

EXPENDITURES

The cost of operating the sewage works was \$149,891.77 during 1971. These figures include the costs for both the provincial and OWRC municipal projects. This was \$5,258.23 below the budget of \$155,150.00. The cost of treating one million gallons of sewage was \$65.17 or approximately 7 cents per pound of BOD removed.

A total of 2,300 million gallons of sewage was treated. The average daily flow of 6.4 mgd exceeded the design capacity of the plant 28 percent of the time.

This overload condition resulted from rain water and spring runoff gaining access to the sewer system via the combined sewers.

CHLORINATION

Chlorination of the final effluent is practiced on a continual year round basis. An average chlorine dosage of 4.4 mg/l was required to obtain an 0.5 mg/l chlorine residual after 15 minute contact period. The new chlorination tank greatly increased the chlorination process in the latter part of 1971.

PLANT EFFICIENCY

The average concentrations of BOD and suspended solids in the plant influent was 125 and 379 mg/l respectively. This resulted in a large increase from the 1970 values. The average concentrations for BOD and suspended solids in the plant effluent were 30 and 60 mg/l respectively. This represents a reduction in BOD and suspended solids of 76 and 97 percent respectively. It should be noted that these results include approximately 8 months of operation as a primary treatment plant. The removal efficiencies for the latter part of the year when the plant was operated as an activated sludge plant were much better.

SLUDGE DIGESTION and DISPOSAL

A total of 10.22 million gallons of raw sludge with an average concentration of 3.2 percent solids was pumped to the digesters. Approximately 3,338 cubic yards of digested sludge was disposed of by tank truck haulage and 475 cubic yards of digested sludge was disposed of on the plant site.

CONCLUSIONS

Operation of the sewage works system was very difficult during part of the year due to expansion of the plant. The BOD and suspended solids removal efficiency increased significantly when the secondary portion of the plant was put into operation. The completion of the expanded facilities in the latter part of 1971 alleviated many of the operating difficulties and resulted in a much improved plant effluent.

ONTARIO WATER RESOURCES COMMISSION

BELLEVILLE SEWAGE WORKS SYSTEM

PROJECT NO. 1-0004-66

BALANCE SHEET

AS AT DECEMBER 31, 1971

(UNAUDITED)

ASSETS

CASH	\$ 14,282.57
ACCOUNTS RECEIVABLE	952,683.32
FIXED ASSETS (at cost)	3,409,882.66
TOTAL ASSETS	\$4,376,848.55

LIABILITIES AND EQUITY

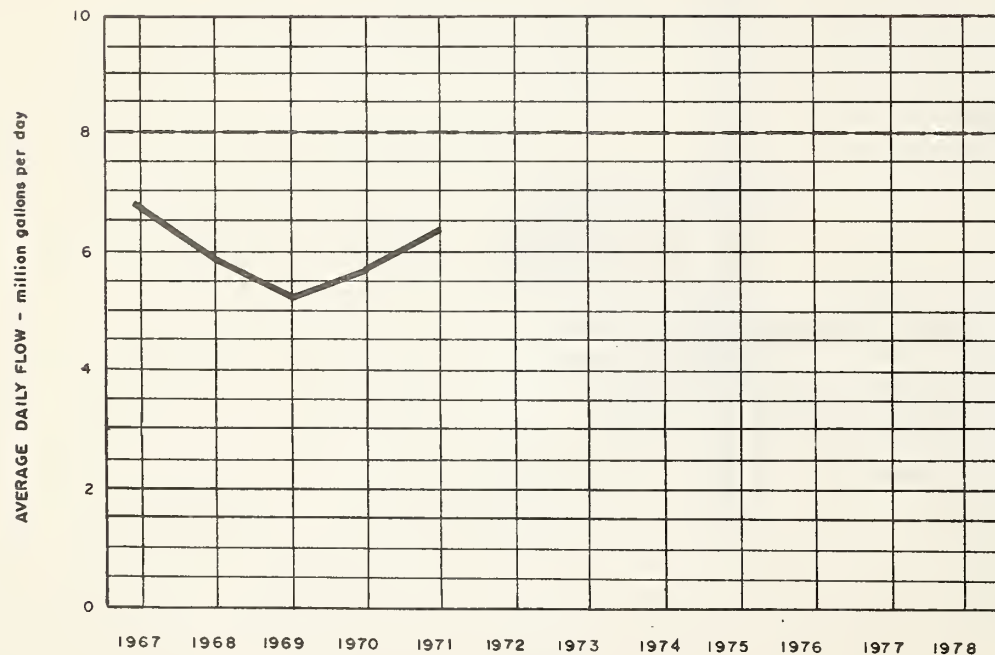
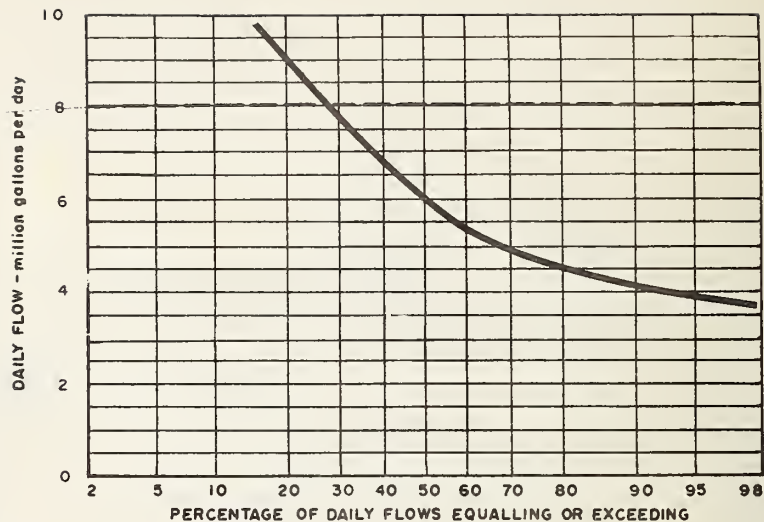
CURRENT LIABILITIES	\$1,157,639.47
LONG TERM DEBT	2,538,970.84
EQUITY	
Contributed	521,832.57
Amortized principal on long term debt	16,791.16
Earned Surplus	
Surplus at beginning of year	\$110,007.74
Surplus for the year 1971	31,606.77
TOTAL LIABILITIES AND EQUITY	\$4,376,848.55

Note

Prepared on an accrued basis.

PROCESS DATA

FLOWS



DESIGN CAPACITY — — — — —

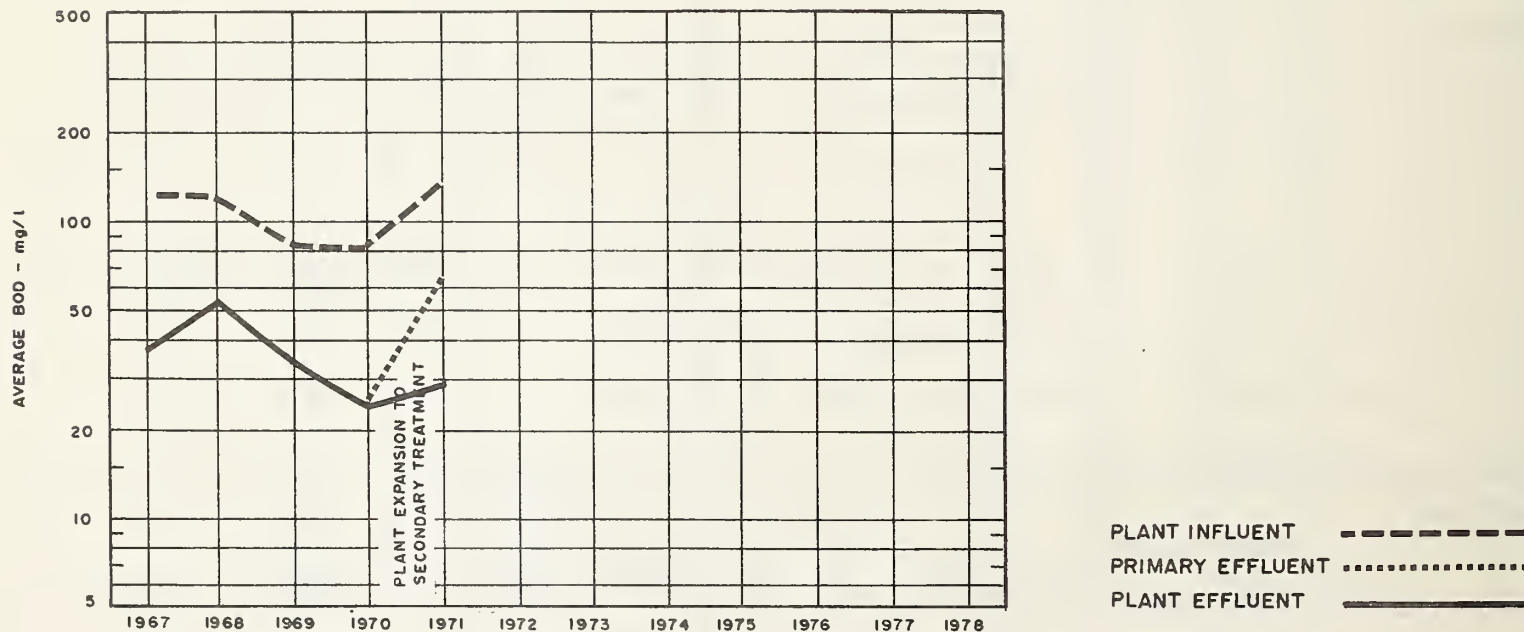
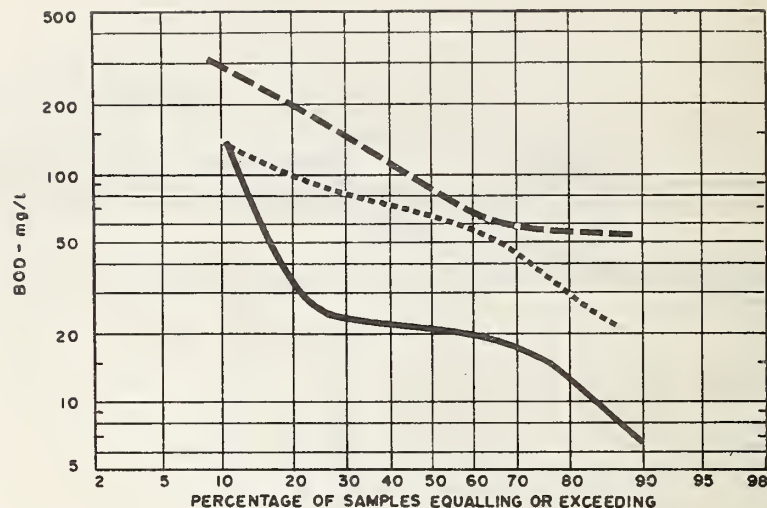
PLANT PERFORMANCE

MONTH	FLOWS				BIOCHEMICAL OXYGEN DEMAND				SUSPENDED SOLIDS				TOTAL PHOSPHORUS		
	TOTAL FLOW	AVERAGE DAY	MAXIMUM DAY	MAXIMUM RATE	INFLUENT	EFFLUENT	REDUCTION		INFLUENT	EFFLUENT	REDUCTION		INFLUENT	EFFLUENT	RED ¹
	million gallons	mil gal	mil gal	mgd	mg/L	mg/L	%	10 ³ pounds	mg/L	mg/L	%	10 ³ pounds	mg/L as P	mg/L as P	%
JAN	240	7.7	10.1	-	120	18	85	240	190	65	66	300	-	-	-
FEB	211 a	9.6	15.8	-	-	-	-	-	-	-	-	-	-	-	-
MAR	204 b	12.0	15.2	-	55	22	60	120	240	120	50	450	4.9	2.3	53
APR	o/s	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAY	o/s	-	-	-	-	-	-	-	-	-	-	-	-	-	-
JUNE	o/s	-	-	-	240	110	54	-	930	120	87	-	9.1	8.4	8
JULY	o/s	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AUG	o/s	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SEPT	171	5.7	11.3	-	85	7	92	120	375	12	97	570	4.6	3.8	17
OCT	171	5.5	9.3	-	190	22	88	260	530	6	99	810	35.0	3.1	91
NOV	124	4.0	5.0	-	60	24	60	44	200	8	96	236	6.3	-	-
DEC	181	5.9	10.4	-	-	18	-	-	-	6	-	-	-	-	-
TOTAL	2300 est	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG.	-	6.4	15.8	-	125	30	76	156	379	60	84	473	12.0	4.4	63
No. of Samples	-	-	-	-	6	-	-	-	7	7	-	-	5	4	-

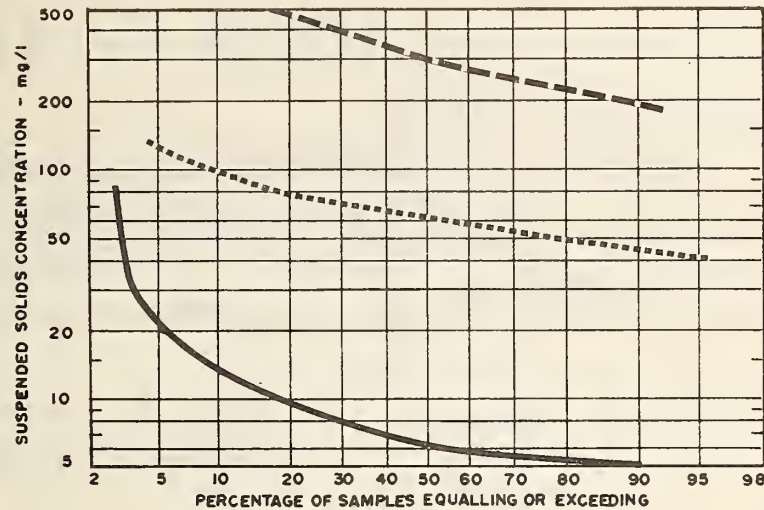
a - 22 days flow data

b - 17 days flow data

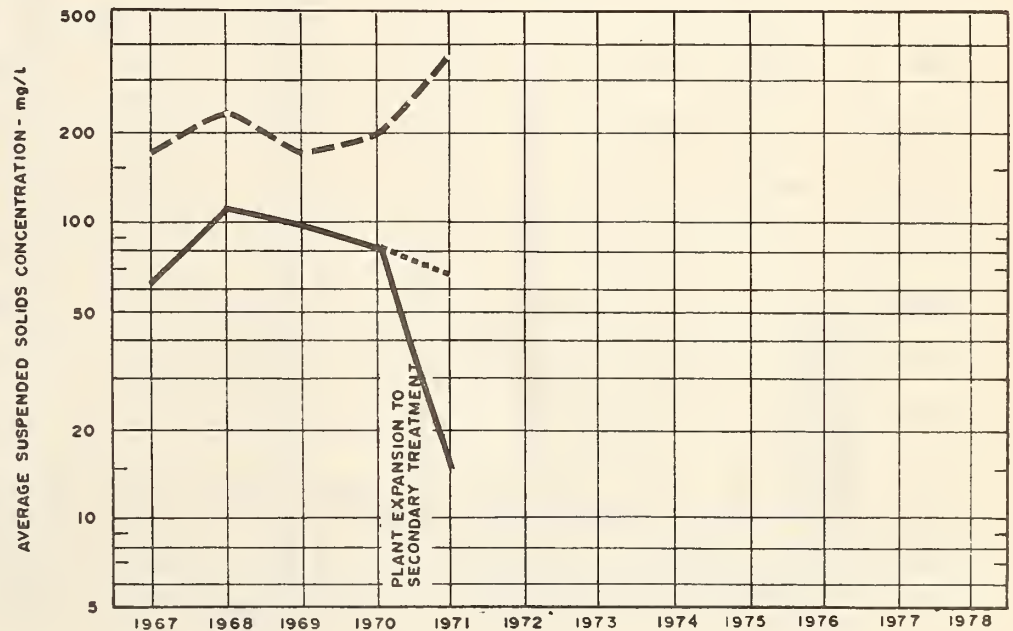
BIOCHEMICAL OXYGEN DEMAND



SUSPENDED SOLIDS



PLANT INFLUENT - - - - -
 PRIMARY EFFLUENT
 PLANT EFFLUENT —————

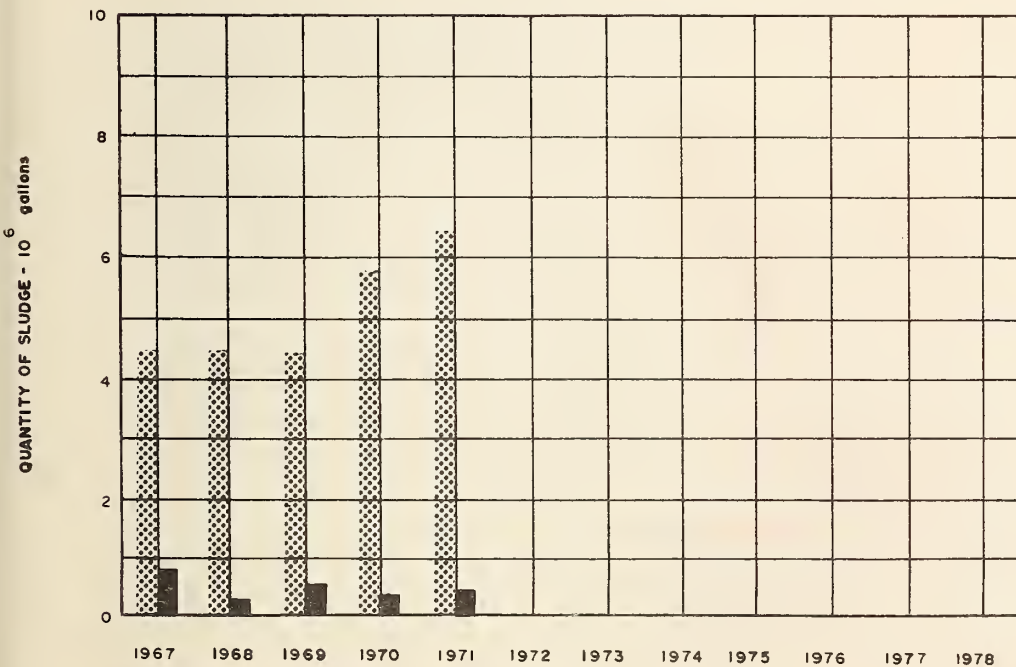
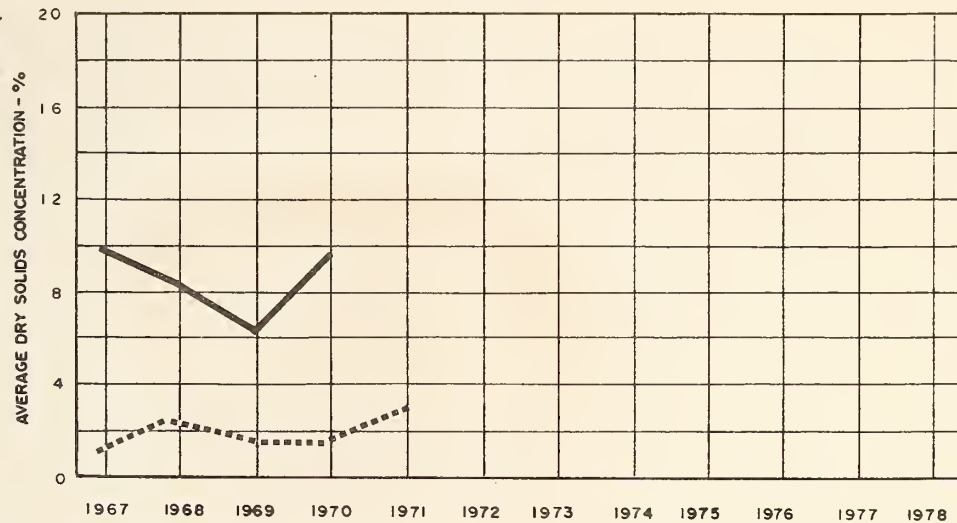


TREATMENT DATA

MONTH	GRIT	CHLORINATION		PRIMARY EFFLUENT		AERATION			SLUDGE DIGESTION and DISPOSAL							
	QUANTITY REMOVED cubic feet	CL ₂ USED 10 ³ pounds	AVG. DOSE mg/l	BOD mg/l	SUSPENDED SOLIDS mg/l	MLSS CONC mg/l	F/M day ⁻¹	AIR 1000 ft ³ lb BOD	RAW SLUDGE			DIGESTED SLUDGE			SUPER- NATANT T. S. %	AMOUNT HAULED cubic yards
									QUANTITY 10 ³ gallons	TOTAL SOLIDS %	VOL. SOLIDS %	QUANTITY 10 ³ gallons	TOTAL SOLIDS %	VOL. SOLIDS %		
JAN	162	6.2	2.6	-	-	-	-	-	650	2.1	61	0	-	-	1.9	0
FEB	0	5.6	2.1	-	-	-	-	-	590	-	-	40.3	-	-	-	240
MAR	0	6.2	1.7	-	-	-	-	-	650	-	-	55.5	-	-	-	330
APR	0	6.0	-	-	-	-	-	-	630	-	-	0	-	-	-	0
MAY	136	6.2	-	-	-	-	-	-	650	2.4	54	0	-	-	-	0
JUNE	0	5.2	-	-	-	-	-	-	630	-	-	79.0	-	-	-	470
JULY	206	7.7	-	-	-	-	-	-	650	2.4	54	28.6	-	-	-	170
AUG	0	7.7	-	-	-	-	-	-	650	2.8	49	33.3	-	-	-	210
SEPT	0	8.3	4.8	-	-	2470	-	-	1260	-	-	0	-	-	-	0
OCT	0	8.3	4.8	-	-	3190	-	-	1300	4.8	60	149.6	-	-	-	415
NOV	684	5.8	4.7	-	60	2780	-	-	1260	4.2	54	140.0	-	-	-	831
DEC	812	8.8	4.8	67	54	3330	-	-	1300	4.0	51	113.2	-	-	-	672
TOTAL	812	82.0	-	-	-	-	-	-	10220	-	-	641.5	-	-	-	3338
AVG.	9 cu. ft/mil gal	6.8	3.2	67	58	2940	-	-	855	3.2	55	53.5	-	-	1.9	278

DIGESTION

RAW SLUDGE
DIGESTED SLUDGE ———



RAW SLUDGE TO DIGESTER
DIGESTED SLUDGE REMOVED ———



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